ARTIFICIAL COLORING OF FLOWERS

By Henry Kraemer

In the *Popular Science Monthly* for August there is an interesting account of " A Visit to Luther Burbank " by Professor de Vries, and in commenting on the production of a blue poppy by Burbank he advances the idea that "probably the change in color is caused by the combination of pigments in some flowers and the chemical constituents of cells of others." For several years I have been making a study of the color substances of plants both chemically and microscopically, and my results have led me to suppose that changes in the colors of flowers could be effected by cultural methods, that is, by feeding the plants with certain chemicals. For about a year I have been carrying on experiments along this line, but so far have obtained no marked results. This may be due to the fact that I have not yet attained exact control conditions, or that the proper chemicals have not been used, or we may find that it is not possible radically to change any of the so-called inherent characters of plants, of which color is one.

In the course of my work I have also become interested in the artificial coloring of flowers. I have used both plant color-substances and aniline dyes, obtaining the most satisfactory results with the latter class of substances. Aqueous solutions of these dyes were supplied the living plant through the soil, or stems of cut flowers were placed directly in the solutions. While I have actually succeeded in getting the growing plant to take up some of these substances under control conditions, as in the production of a blue carnation, the most striking results have been obtained with cut flowers. When the flowers are not too far advanced even though they have been cut several days, the effects are frequently observed in from 10 to 15 minutes, and usually in less than an hour the maximum effects are obtained. Apparently all white flowers will take up the dyes which I shall enumerate, being changed to yellow, orange, blue, green, purplish-red or magenta, crimson, purple, salmon-pink and gray.

These dyes may be used also to intensify flowers having a pale color, as of pale-yellow carnation, pink rose, etc. In some cases the natural colors can be modified, as in the production of a yellowish-red flower of snapdragon from a yellow flower. In the accompanying table the following data are given :

1. The colors produced in white flowers when the stems are placed in aqueous solutions of the dyes.
2. The common names of the dyes.
3. The composition of the dyes.
4. The colors of the dyes or mixtures used.
5. Colors of the aqueous solutions.

Color Produced in White Flowers.	Common Name of Dye.	Composition of Dye.	Color of Dye or Mixture.	Color of Aqueous Solution.
Canary yellow.	Acid Yellow A. T. (C).	Sodium salt of disulpho-diphenylazin-dioxytartaric acid.	Bright orange-yellow.	Golden-yellow.
Orange.	Orange G. G. (C).	Sodium salt of benzene-azo-B-naphthol-disulphonic acid.	Yellowish- or carmine-red.	Brownish-red.
Blue.	Cyanole F. F. (C).	Sodium salt of metaoxy-diethyl-diamidophenyl-ditolyl-carbinol-disulphonic acid.	Dark-blue.	Deep purplish-blue.
Green.		A mixture of equal parts of Acid Yellow A. T. and Cyanole F. F.	Deep bluish-gray.	Dark-green.
Purplish-red or magenta.	Acid Magenta (C).	Sodium salt of the tri-sulphonic acid of rosaniline.	Deep-brown.	Purplish-red.
Crimson.		A mixture of equal parts of Acid Yellow A. T. and Acid Magenta.	Yellowish-brown.	Crimson.
Purple.		A mixture of equal parts of Cyanole F. F. and Acid Magenta.	Grayish-blue.	Purple.
Salmon-pink.	Brilliant Croceine M. O. O. (C).	Sodium salt of benzene-azo-benzene-azo B-naphthol-disulphonic acid.	Brick-red.	Light-crimson.
Pale salmon-pink.	Crystal Scarlet 6 R. (C).	Sodium salt of a naphtylamine-azo-B-napthol disulphonic acid.	Reddish-brown crystals with golden reflect.	Rose-red.
Dark gray or blackish.	Naphtol Black B. (C).	Sodium salt of disulpho-B-naphthalene-azo-A-naphthalene-azo-B-naphtol-disulphonic acid.	Bluish-black.	Deep violet.

These dyes are readily soluble in water, and the solutions are made by simply dissolving the dye in water, the proportion being about ⅛ ounce of dye to 1 pint of water. This solution can be diluted as much as ten times and still be effective. When the desired effect has been produced, which is usually in an hour or less, the flowers should be transferred to water. The solutions will keep for some days, and a pint of solution will color a large number of flowers.

While the artificial coloring of flowers in the manner described is of more or less interest from the scientific point of view, it has also a practical application. In decorative schemes where a particular color is selected, this method could be used for producing flowers all of one color. Or in some instances, where the demand for flowers of a certain color is greater than the supply, artificially colored flowers could be produced from white ones. Then again in the production of novelties, as of green carnations and green roses, the method can be utilized. The color produced by Naphtol Black B is a delicate gray or grayish-black, and it has been suggested that roses and carnations so colored would furnish appropriate mourning flowers. Another use of these dyes is in the coloring of wild flowers for decorative purposes. For example, wild carrot when colored with the blue dye gives a beautiful effect, being suggestive of a head of small forget-me-nots.

Finally it should be stated that the odor of flowers is not affected by this treatment, and that they keep as well as cut flowers ordinarily do. The colors are furthermore, permanent, and when the flowers are preserved in the dried condition, as is sometimes done with hydrangeas, a color can be selected according to the fancy, as blue, green, yellow, red, and so on.

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A KEY TO THE AGARICEAE OF TEMPERATE NORTH AMERICA

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The Agariceae are not ordinary gill-fungi, but are a subfamily of the Polyporaceae with furrowed hymenium. They differ from